PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-063329
(43)Date of publication of application : 07.03.1997

(51)Int.Cl. F21V 7/22

(21)Application number : 07-222327
(22)Date of filing : 30.08.1995

(71)Applicant : MINNESOTA MINING & MFG CO <3M>
(72)Inventor : UCHIYA TOMOAKI
SHIODA AKIRA
OKADA MICHIHIKO
NAGAMATSU HIDENORI
NANBA TAKAAKI

(54) REFLECTING SHEET FOR LIQUID CRYSTAL BACK LIGHT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide higher luminance for a reflection sheet, which is to be used for wrapping a linear tubular fluorescent lamp of a back light apparatus of an edge type liquid crystal display panel and make the sheet thinner using a weaker film.
SOLUTION: Hollow particles with outer diameter 0.05–10μm and inner diameter 0.2–0.9 times as wide as the outer diameter are mixed with a resin binder of (meth)acrylic acid copolymer. A reflection coating material produced by mixing the resultant mixture is layered on the surface of a film-like supporting body with 25–50μm thickness to give a reflection sheet.

LEGAL STATUS

[Date of request for examination] 13.08.2002
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] (Meta) Acrylic ester copolymer ("acrylic ester (meta)" means acrylic ester or methacrylic ester here.) below the same. from -- reflective sheet which carried out the laminating of the reflective paint which comes to mix an empty capsid in the becoming resin binder to the film-like support surface.
[Claim 2] said empty capsid -- outer diameter of 0.05-10 micrometers it is -- reflective sheet according to claim 1 whose bore is 0.2 to 0.9 times the outer diameter.
[Claim 3] the thickness of said reflective paint -- 10-100 micrometers it is -- reflective sheet according to claim 1 or 2.
[Claim 4] A reflective sheet given in any 1 term of claims 1-3 whose blending ratio of coal of said empty capsid is the 20 - 800 weight section to the solid content 100 weight section of said resin binder.
[Claim 5] A reflective sheet reflective sheet given in any 1 term of claims 1-4 to which the average transmission coefficient of the light of a 400-800nm wavelength field has the aforementioned (meta) acrylic ester copolymer in the range whose glass transition temperature it is 80% or more and is -75-30 degrees C.
[Claim 6] A reflective sheet given in any 1 term of claims 1-5 which carried out the laminating of the white coating which contains titanium oxide between a field opposite to the field which carried out the laminating of said reflective paint of said base material or the field of the base material which carried out the laminating of said reflective paint, and a reflective paint.
[Claim 7] A reflective sheet given in any 1 term of claims 1-6 in which said reflective paint contains inorganic white pigments.
[Claim 8] A reflective sheet given in any 1 term of claims 1-7 which carried out the laminating of the inorganic white pigments to the field of the base material and the opposite side of said reflective paint.
[Claim 9] The manufacture approach of a reflective sheet given in any 1 term of claims 1-8 including applying to a base material the fluid reflective paint which comes to mix a drainage system acrylic binder to the water dispersing element of an empty capsid, and 90 degrees C or more drying in the melting point of said base material, or below softening temperature.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the reflective sheet arranged on the background of the reflective sheet arranged so that a reflective sheet and straight pipe [which has been arranged along with the edge of a light guide plate especially in the inside of the back light equipment of a liquid crystal display panel and an edge method]-like fluorescent lamp may be wrapped in, and a light guide plate.
[0002]
[Description of the Prior Art] By the edge method, the straight pipe-like fluorescent lamp is arranged along with the edge of a light guide plate among the back light equipment of a liquid crystal display panel. Although a part of light which came out of the fluorescent lamp of a light guide plate is led to a direct light guide plate, it is reflected with the reflective sheet arranged so that a fluorescent lamp may be wrapped in, and ON light of the remaining light is carried out to a light guide plate. It is reflected in a rear face by the optical diffusion layer printed in the shape of a halftone dot, and the light led to the light guide plate is left from a light guide plate front face (illumination side). Moreover, it is reflected with the reflective sheet arranged on the background of a light guide plate, and the light which went to the background of a light guide plate from between optical diffusion layers goes to a front-face side. Generally white-pigments ink and the thing which made this distribute a glass bead were used for the optical diffusion layer.
[0003] As a means which makes an illumination side brighter, many reports are made about the above-mentioned optical diffusion layer until now. In JP,4-66519,B, what has a detailed centrum by foaming as this optical diffusion layer, or screen-stenciled resin hollow powder is indicated. At JP,4-76593,A, it is the diameter of 0.1-20 micrometers as this optical diffusion layer. What screen-stenciled the hollow polymer which consists of acrylic resin is indicated. In JP,5-273552,A, what screen-stenciled the reflective bead which enclosed the detailed transparence bead and the white system pigment as this optical diffusion layer is indicated. To JP,5-303017,A, what carried out coating processing of the organic fluorescence derivative on the front face of super-very fine particle-like titanium oxide is ink-ized with an acrylic binder, and what was screen-stenciled to the halftone dot gradation pattern is indicated. To JP,6-94923,A, a foaming coating is printed as this optical diffusion layer, and the method of making detailed air bubbles form is indicated.
[0004] Most examination about the component part of other back light equipments is not made about the optical diffusion layer which prepared all of these improvement means in brightness in the light guide plate rear face by approaches, such as screen-stencil. Since it has the problem of the high frequency current leaking this type from a fluorescent lamp although the polyester film of silver vacuum evaporationo etc. may be used as a reflective sheet arranged so that a fluorescent lamp may be wrapped as what makes brightness high, and the consumed electric current increasing, at recent years, it is 75 micrometers in thickness. White polyester film etc. is used. Moreover, in the background of a light guide plate, it is 188 micrometers in thickness. White foaming polyester film is used. These white foaming polyester film is used for the above-mentioned patent official report also for invention of a publication. These white foaming polyester

film had the low reflection factor compared with silver vacuum evaporationo polyester film, and the brightness when including in back light equipment was low about 10% or more.
[0005] For this reason, as an amelioration article which raised brightness more, as shown in drawing 2 , it is 75 micrometers in the above-mentioned thickness. White ink 6 is applied to the background of white foaming polyester film 5. Although the reflective sheet which has the reflecting layer 7 which consists of a barium sulfate and an acrylic binder was developed and used for the reflector side (Kimoto Make, RW75C), brightness was not that with which it improves only 3 to 5% compared with elegance conventionally, but satisfaction goes enough.
[0006] Moreover, thin shape-ization of a liquid crystal panel is desired and narrow diameter-ization of a fluorescent lamp is progressing as the result in recent years. 75 micrometers in thickness used so far In foaming polyester film, when including in back light equipment so that a fluorescent lamp may be wrapped in, there was a problem that the waist was too strong, workability was bad, and productivity did not go up. Moreover, light often caused from there the problem that leakage and brightness fell, by the box of a liquid crystal panel joining together, extruding a part, and producing a clearance. On the other hand, in order to weaken the waist, when thickness of white foaming polyester film was made thin, there was a problem that brightness fell, so that the film became thin.
[0007]
[Problem(s) to be Solved by the Invention] For this reason, in order to obtain the screen of high brightness, the reflection factor was more high and development of the weak reflective sheet of the waist was desired. The technical problem of this invention is offering such a reflective sheet.

[0008]
[Means for Solving the Problem] This invention is acrylic ester (meta) (the thing of acrylic ester or methacrylic ester is said.). It is below the same. It is the reflective sheet which comes to carry out the laminating of the reflective paint which comes to blend an empty capsid with the binder which consists of a copolymer to one side of film-like base materials, such as polyester.
[0009] the particle size of said empty capsid -- about 0.05-10 micrometers it is -- a thing is good. When smaller than about 0.05 micrometers, a particle small such is made from an emulsion polymerization, because it is difficult, and even if it can make, it is because it is low and light-scattering ability becomes [brightness] low. About 10 micrometers It is because the scattering power of light will fall and brightness will become low, if a case as many small holes are in a particle is removed (when it is not one spherical hole) if large. Moreover, as for the rate to the outer diameter of the bore of this empty capsid, 0.2-0.9 are desirable. This rate becomes [the rate of the hole of the interior at the time of forming a reflective-paint layer (it being called a "reflecting layer" below)] very small less than at 0.2, and brightness falls. Moreover, since it will become the form which could not maintain the shape of a ball and was crushed, or it will be divided and brightness will fall too when the reinforcement of an empty capsid fell and dries if 0.90 is exceeded, it is not desirable.
[0010] This empty capsid may be made of the organic material, and may be made of the inorganic material. It is more desirable to be made of the organic material, since the thing of the above-mentioned outer diameter is difficult to get, although the empty capsid of glass exists as an inorganic material. the diameter empty capsid of organic -- an acrylic monomer and a styrene system monomer -- an emulsion polymerization -- or a suspension polymerization is carried out and it is obtained. The detail of manufacture of this organic empty capsid is well-known, for example, is indicated by JP,62-127336,A, JP,3-9124,B, etc.
[0011] (Meta) The rate of a compounding ratio of a binder and an empty capsid which consists of an acrylic ester copolymer also affects brightness. the addition of an empty capsid -- the binder 100 weight section -- receiving -- desirable -- the 20 - 800 weight section -- it is the 100 - 300 weight section still more preferably. If there are few additions of an empty capsid than 20 weight sections, brightness will become small, and if [than the 800 weight sections] more, the film production nature of a reflective paint will worsen and will become the very weak film.
[0012] The binder used by this invention has high transparency, after use of long duration has that desirable in which the optical property does not deteriorate, and an acrylic ester (meta)

copolymer is suitable for it. Specifically as this (meta) acrylic ester copolymer, an acrylic-acid (meta)-(meta) acrylic ester copolymer, an acrylic-acid (meta)-(meta) acrylic ester-styrene copolymer, a silicone graft (meta) acrylic ester copolymer, etc. are illustrated. Also in these resin, it is 50 micrometers in thickness. Although the film was produced on the film, that whose 23-degree C average transmission coefficient of the light of a 400-800nm wavelength field is 80% or more is desirable. Brightness becomes small and is not desirable when this permeability is less than 80%. Moreover, the glass transition temperature (Tg) of these resin has a desirable thing in the range of -75-30 degrees C. With the acrylic ester (meta) copolymer below -75 degree C, cohesive force runs short of Tg, and a tuck comes out to a reflecting layer front face, and it dirt-comes to be easy. When Tg exceeded 30 degrees C, the flattery nature of a reflecting layer is lost and a reflective sheet is incurvated, a reflecting layer crocodiles and peeling-omission-comes to be easy.

[0013] The effect of as opposed to brightness in the direction of permeability of a binder is larger than a refractive index, and especially the permeability after aging is important for it. Even if high brightness is shown in early stages, in that to which heat aging Ushiro's permeability falls, the brightness after long duration use falls and it is not desirable. Moreover, as properties other than brightness, film production nature and adhesion with a base material are also important, and what has these not enough has risk of causing the serious defect in which it separates and falls from a base material after long duration use. The result evaluated about the binder is shown in Table 1. Data given in Table 1 are data of 1-time observation.

[0014]

[Table 1]

A binder Permeability (%) Permeability (%) Name of article A manufacturer Class Refractive index First stage After heat aging E-1054K Soken Chemical & Engineering, Inc. Acrylic 1.470 94.6 91.5 AN-49B Soken Chemical & Engineering, Inc. Acrylic 1.468 95.6 93.4 E-2150 Soken Chemical & Engineering, Inc. Acrylic 1.472 93.6 89.0 SX-8307A04 Japan Synthetic Rubber Co., Ltd. Acrylic - 1.476 100.0 96.2 Silicone S-6211 Toho Chemical Industry Co., Ltd. Polyethylene 1.503 97.550.0 RW75C Kimoto [Table 1] (continuation)

Binder Brightness (%) Brightness (%) A name of article First stage After heat aging Adhesion of a reflecting layer E-1054K 106.7 98.0 Fitness AN-49B 106.8 102.0 Fitness E-2150 104.3 98.8 Fitness SX-8307A04 102.0 100.0 It separated after aging and fell. S-6211 103.5 79.2 RW75C * which separated after aging and fell 100.0 - Good Notes

Refractive index: It measured with the Abbe refractometer.

Permeability: The U-4000 mold recording spectrophotometer (Hitachi Make) was used.
50 micrometers in thickness The film was made and it measured on the wavelength of 400nm. Each above-mentioned film has the smallest permeability of 400nm in 400-800nm of wavelength fields.

Heat-aging conditions: 100 degrees C, 180 hours.

Brightness: The reflective sheet which the empty capsid (the Nippon Zeon Co., Ltd. make and MH5055 are used) was mixed with these binders at a rate of 100:200 (weight ratio), and also consists of a reflecting layer, a base material, and a white ink layer like the after-mentioned example 14 was made, and brightness was measured. The numeric value of brightness was expressed as the rate (%) to the brightness of Kimoto RW75C (first stage). The brightness of the heat aging sample of RW75C has not been measured.

Adhesion of a reflecting layer: Adhesion was observed with the naked eye about the reflective sheet made like the time of measuring the above-mentioned brightness.

* : it is not a binder but a reflective sheet.

[0015] Although the reflective sheet made using the above-mentioned SX-8307A04 separated after heat aging and fell in the above-mentioned trial, this point can improve by priming etc.

[0016] Said reflective sheet applies the fluid reflective paint which comes to mix a drainage system acrylic binder to the water dispersing element of an empty capsid to a base material, and can manufacture it by drying. It includes that that it describes above " applies" applies and carrying out a spray. The temperature at the time of said desiccation is 90 degrees C or more, and is desirable. [of the melting point of said base material or below softening temperature]

Said reflective paint makes a solvent distribute the empty capsid marketed by fine particles, and although obtained also by combining a binder, it can manufacture that it is easier from a viewpoint of productivity to mix a drainage system acrylic binder to a water dispersing element, and cheaply. the thickness of the reflective paint after desiccation -- 10-100 micrometers it is -- things are desirable. 10 micrometers In the following, brightness is low and it is 100 micrometers. It is for a problem to crop up at spreading processes -- if it exceeds, a front face will crocodile, or a spreading rate falls. the case where the reflective paint of a drainage system is used -- drying temperature -- 100 degrees C or more -- required -- in addition -- and dimensional stability is required on the occasion of use. For this reason, as a base material, polyester film or foaming white polyester film is desirable.

[0017] As an example of a film usable as a base material, films, such as extension polypropylene, polyester, nylon, a polycarbonate, polysulfone, polyether sulphone, a polyether ether ketone, polyphenyl sulfide, polyarylate, polyethylenenaphthalate, the polyester ether, and a polyvinyl chloride, an acrylic film, the poly methyl terpene resin film, etc. are mentioned. The thickness of these films is 75 micrometers as stated also in advance. The thinner one is desirable. The thickness of this film is 75 micrometers. When the package of a reflective sheet which wraps in the fluorescent lamp in a back light sheet became imperfect besides the problem that the workability at the time of including in back light equipment is bad so that a fluorescent lamp may be wrapped in as it is above, and productivity does not go up, light often caused from there the problem that leakage and brightness fell. Moreover, when too thin, it is not desirable in order for it to become impossible to arrange so that a beautiful arc may be drawn and to reduce brightness, when a wrinkling comes together and a reflective sheet is wound around fluorescence tubing, in case there is too little repulsion and it incorporates. For this reason, the thickness of polyester film is 25-50 micrometers. It is desirable. The workability when changing the thickness of polyester film is shown in Table 2.

[0018]

[Table 2]

A film Thickness (micrometer) Inclusion workability Inclusion Ushiro's condition Optical leakage 12 Fitness A wrinkling enters. Have no leakage. 25 Fitness Have no wrinkling. Have no leakage. 38 Fitness with no wrinkling-less leakage 50 repulsion -- strong -- activity difficulty With no wrinkling With no leakage 75 repulsion -- strong -- elapsing -- activity difficulty Curvature size of an arc [0019] which leaks from a clearance somewhat The reflecting layer of a reflective sheet is possible also for forming the high white coating of the concealment nature containing titanium oxide between the opposite side or a base material, and a reflecting layer. By preparing the concealment layer of such white, transparency of light can be prevented and brightness can be raised. The sectional view of an example of this invention is shown in drawing 1 . As for a base material layer and 2, in this drawing, 1 is [a reflective-paint layer and 3] white ink layers.

[0020] Brightness can be improved also by blending inorganic white pigments or a hollow glass bead with a comparatively large particle size (it being technically difficult to make a hollow glass bead with a diameter smaller than 10 micrometers now) with a reflective paint as the 3rd component. As inorganic white pigments, titanium oxide, zinc sulfide, a hollow glass bead, a barium sulfate, an aluminum silicate, a titanium oxide content acrylic bead, etc. are illustrated. Also in these, when titanium oxide, zinc sulfide, etc. are mixed to a reflective paint, even if there is no above-mentioned concealment layer, high brightness is obtained.

[0021] It is also possible to apply to an acrylic ester copolymer further (meta) the reflective paint which comes to blend inorganic white pigments on the reflecting layer of a reflective sheet. In such a case, it is 1-10 micrometers on a reflecting layer about what blended inorganic white pigments with the acrylic resin 100 weight section with high permeability with sufficient film production nature before and after the 100 weight sections. Surface reinforcement can be raised by what (it is called topcoat) is applied by thickness, without reducing brightness.

[0022] Since a reflective sheet is arranged so that it may be twisted around a fluorescent lamp and a reflective sheet deteriorates under the effect of ultraviolet rays and the heat which are emitted from a fluorescent lamp, the optical property, especially brightness may fall depending on an operating condition. in order to prevent these problems -- a reflective paint -- an antioxidant,

an ultraviolet ray absorbent, or UV stabilizer — 0.01 - 5wt% — adding is desirable. As an anti-oxidant, 2, 4-screw [(octylthio) methyl]-o-cresol, iso octyl-3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate, etc. are mentioned. As an ultraviolet ray absorbent, a methyl-3-[3-t-butyl-5-(2H-benzotriazol-2-IRU)-4-hydroxyphenyl] propionate-polyethylene glycol, a hydroxyphenyl benzotriazol derivative, etc. are mentioned. As UV stabilizer, screw (2, 2, 6, and 6-tetramethyl-4-PIPEJIRIJIRU-4-piperidyl) sebacate etc. is mentioned. These are good to use independently and mixing and using is also possible. Moreover, effectiveness is for adding the inorganic filler which has said ultraviolet ray absorbent or an ultraviolet-rays shielding effect in said topcoat to also raise weatherability. Since it is the minute empty capsid which mainly contains the styrene in a reflective paint, that it is the cause of degradation by ultraviolet rays has effectiveness also in permuting a part of empty capsid by the inorganic filler with more sufficient weatherability improving weatherability.

[0023]

[Example] According to the report of each manufacturer, in the following examples and examples of a comparison, the contents of the empty capsid used for the reflective paint are as follows.

[Table 3]

A lot number A manufacturer An ingredient Outer diameter (micrometer) A bore / outer-diameter OP-62 Loam & Haas . Japan, Inc. Styrene acrylic 0.45 0.69 OP-84J Loam & Haas . Japan, Inc. Styrene acrylic 0.55 0.64 HP-91 Loam & Haas . Japan, Inc. Styrene acrylic 1.00 0.80 AE-863A Japan Synthetic Rubber Co., Ltd. Styrene acrylic 0.35 0.80 MH5055 Nippon Zeon Co., Ltd. Styrene acrylic 0.50 0.82 [0024] Moreover, the binders used for this reflective paint were the Soken Chemical & Engineering make and SK dyne (trade name) AN-49B, the ingredient was an acrylic ester copolymer, that Tg was -48 degree C, and the average transmission coefficient of the light in the wavelength field which is 400-800nm was 97%.

[0025] Moreover, the contents of the filler used for such reflective paints or topcoats were as follows.

[Table 4]

A manufacturer A trademark thru/or a lot number An ingredient cable address Dainichiseika Colour & Chemicals Mfg. Co., Ltd. in Table 5 EP -- 677 White TiO2 677 White SACHTLEBEN CHEMIE SAKUTORISU (trademark) ZnS HD-S GMBH HD-S Toshiba Ballotini Toshiba hollow glass A hollow glass bead HSC110 Co., Ltd. -- Bead HSC110 Degussa Japan Aluminum Silicate Aluminum silicate P-820 Co.Ltd. P-820 Merck Japan IRIO DIN Pearl pigment 103W2 Co., Ltd. -- (trademark) 103W2 [0026] (Examples 1-7) white foaming polyester film (the product made from ICI --) with a thickness of 36 micrometers the easily-adhesive processing side of MELINEX (trademark)337 (examples 1-2, 4-7) or non-foamed transparence polyester film (example 3) with a thickness of 36 micrometers — white ink (the Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make --) RAMIKKU (trademark) F-220HC — white -- what blended titanium oxide into the acrylic urethane binder -- it is — titanium oxide 50wt% — the thickness after drying what is contained -- 20 micrometers Spreading desiccation was carried out so that it might become, and the white sheet was obtained. About the reflective paint mixed by combination given in Table 3 on the white ink layer of this white sheet, the thickness after desiccation is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. The slit of the obtained reflective sheet is carried out to the shape of a strip of paper with a width of face [of 20mm], and a die length of 219mm. A double faced adhesive tape (NITTO DENKO CORP. make #531) with a width of face of 2mm is used. It fixed to said light guide plate, it included in back light equipment, and brightness was measured so that fluorescence tubing with a diameter of 2.6mm arranged at the end of a light guide plate (thickness of 3.2mm of width of face of 164mm, die-length 219 mm, and a fluorescence tubeside, thickness of 1.2mm of the opposite side) might be wrapped in. Luminance-meter LS-110 by Minolta Co., Ltd. were used for measurement of brightness. Brightness is similarly measured about Kimoto RW75C (example 1 of a comparison), and the value (%) of the relative brightness to this is shown in Table 5.

[0027] (Examples 8-19) For a white ink layer, to the same transparence sheet (example 9) as having used in the same white sheet (examples 8, 10-19) or same example 3 as having used in

the example 1, the thickness after drying a reflective paint given in Table 5 to the field of the opposite side is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. About this reflective sheet, brightness was measured like the example 1. The value of this relative brightness is shown in Table 5.

[0028] (Examples 20-22) The reflective paint containing the filler indicated in Table 5 on the reflective paint of the reflective sheet obtained in the example 8 (the used binder) The product made from Japanese Composition, a silicone graft type acrylic ester copolymer (trade name: silicone acrylic emulsion SX-8307(A)04), The average transmission coefficient of the light in a wavelength field (Tg=5 degree C and 400-800nm) carries out spreading desiccation of the 100% so that the thickness after desiccation may be set to 5 micrometers (the layer obtained by doing in this way is called topcoat.). The reflective sheet was obtained. About this reflective sheet, brightness was measured like the example 1. The value of this relative brightness is shown in Table 5.

[0029] (Example 1 of a comparison) Brightness was measured like the example 1 using Kimoto reflective sheet RW75C. The result is shown in Table 5. In addition, this reflective sheet is 75 micrometers in thickness. In the background of white polyester film, it is TiO2 to an urethane binder. It is 30 micrometers in thickness about the white ink which it comes to mix. 5 micrometers in thickness which applies and is from a barium sulfate and an acrylic binder on a reflector side It is the sheet which has a reflecting layer.

[0030] (Example 2 of a comparison) 36 micrometers in thickness The thickness after drying white ink (the Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make, RAMIKKU (trademark) F-220HC white) (titanium oxide) to the easily-adhesive processing side of the polyester film (the product made from ICI, MELINEX 337) of a white sheet is 20 micrometers. Spreading desiccation was carried out so that it might become, and the white sheet was obtained. About the case where the white ink side of this white sheet is turned to fluorescence tubing, brightness was measured like the example 1. The result is shown in Table 5.

[0031] (Examples 3 and 4 of a comparison) For the white ink layer of the example 2 of a comparison, the thickness after drying a reflective paint given in Table 5 to an opposite side is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. Brightness was measured like the example 1 about this reflective sheet. The result is shown in Table 5.

[0032]

[Table 5]

Example Reflective sheet Reflecting layer combination (or configuration) Compounding ratio (weight ratio) Example of a brightness comparison Configuration empty capsid Binder Filler hollow: — binder: -- filler (%) Example 1 RWB OP-62 AN-49B - 200:100 113 Example 2 RWB OP-62 AN-49B - 400:100 121 Example 3 RWB OP-62 AN-49B - 200:100 115 Example 4 RWB OP-62 AN-49B 677White 150:100:50 115 Example 5 RWB OP-62AN-49B HD-S 160:100:40 117 Example 6 RWB OP-62 AN-49B HSC110 160:100:40116 Example 7 RWB OP-62 AN-49B P-820 160:100:40 115 Example 8RBW OP-62 AN-49B - 200:100 121 Example 9 RBW OP-62 AN-49B - 200:100 118 Example 10 RB OP-62 AN-49B -200:100 117 Example 11 RBW OP-84J AN-49B - 200:100 117 Example 12 RBW HP-91AN-49B - 200:100 120 Example 13 RBW AE-863A AN-49B - 200:100 117 Example 14 RBW MH5055 AN-49B - 200:100 117 Example 15 RBW OP-62 AN-49B 677White 150:100:50 118 Example 16 RBOP-62 AN-49B 677White 150:100:50 115 Example 17 RBW OP-62 AN-49B HD-S 160:100:40 121 Example 18 RBW OP-62 AN-49B HSC110 160:100:40 120 Example 19 RBW OP-62 AN-49B P-820 160:100:40 117 Example 20 TRBW1 OP-62 AN-49B - 200:100 117 Example 21 TRBW2 OP-62 AN-49B - 200:100 117 Example 22 TRBW3 OP-62 AN-49B - 200:100 115 Example 1 of a comparison RBW Kimoto Make, RW75C - 100 Example 2 of a comparison WB MELINEX 337 36micrometer WhitePET - 107 Example of comparison 3RBW - AN-49B 103W2 0:100:200 90 Example 4 of a comparison RBW - AN-49B HSC110 0:100:200 103 Notes

R: Reflecting layer W: White ink layer B: Base material layer T: Topcoat layer TRBW1: It is BaSO4 as a filler of topcoat. Use.

TRBW2: Use the Toshiba Ballotini Co., Ltd. make and Toshiba hollow glass bead HSC-110 (trade

name) as a filler of topcoat.
TRBW3: It is Degussa as a filler of topcoat. Japan Co
The product made from Ltd., Aluminum Silicate P-820 is used.
[0033] (Example 23) To the reflective paint, everything but having carried out 2.0 weight sections addition of Ciba-Geigy Japan TINUVIN (trademark)765 by solid content conversion obtained the reflective sheet by the same approach as an example 8 as UV stabilizer. When this reflective sheet was built into the back light unit and measured, brightness high 15% was shown compared with Kimoto RW75C. Moreover, the reflective sheet and Kimoto RW75C which were obtained as mentioned above were respectively included in the back light unit, and after leaving it in 80-degree C oven for 230 hours, energizing to a fluorescent lamp, only the reflective sheet was taken out and it included in a new back light unit. When each brightness was measured, the reflective sheet obtained as mentioned above showed the value high 12% to Kimoto RW75C, although brightness was falling 3% to initial value.
[0034]
[Effect of the Invention] 75 micrometers in thickness which was used for wrapping the straight pipe-like fluorescent lamp of the thing of the inner edge method of the back light equipment of a liquid crystal display panel conventionally according to this invention Compared with white foaming polyester film, it is more thin and the reflective sheet which can realize the higher brightness of said back light equipment can be offered using a film with the weak waist.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the reflective sheet arranged on the background of the reflective sheet arranged so that a reflective sheet and straight pipe [which has been arranged along with the edge of a light guide plate especially in the inside of the back light equipment of a liquid crystal display panel and an edge method]-like fluorescent lamp may be wrapped in, and a light guide plate.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the reflective sheet arranged on the background of the reflective sheet arranged so that a reflective sheet and straight pipe [which has been arranged along with the edge of a light guide plate especially in the inside of the back light equipment of a liquid crystal display panel and an edge method]-like fluorescent lamp may be wrapped in, and a light guide plate.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] By the edge method, the straight pipe-like fluorescent lamp is arranged along with the edge of a light guide plate among the back light equipment of a liquid crystal display panel. Although a part of light which came out of the fluorescent lamp of a light guide plate is led to a direct light guide plate, it is reflected with the reflective sheet arranged so that a fluorescent lamp may be wrapped in, and ON light of the remaining light is carried out to a light guide plate. It is reflected in a rear face by the optical diffusion layer printed in the shape of a halftone dot, and the light led to the light guide plate is left from a light guide plate front face (illumination side). Moreover, it is reflected with the reflective sheet arranged on the background of a light guide plate, and the light which went to the background of a light guide plate from between optical diffusion layers goes to a front-face side. Generally white-pigments ink and the thing which made this distribute a glass bead were used for the optical diffusion layer.
[0003] As a means which makes an illumination side brighter, many reports are made about the above-mentioned optical diffusion layer until now. In JP,4-66519,B, what has a detailed centrum by foaming as this optical diffusion layer, or screen-stenciled resin hollow powder is indicated. At JP,4-76593,A, it is the diameter of 0.1-20 micrometers as this optical diffusion layer. What screen-stenciled the hollow polymer which consists of acrylic resin is indicated. In JP,5-273552,A, what screen-stenciled the reflective bead which enclosed the detailed transparence bead and the white system pigment as this optical diffusion layer is indicated. To JP,5-303017,A, what carried out coating processing of the organic fluorescence derivative on the front face of super-very fine particle-like titanium oxide is ink-ized with an acrylic binder, and what was screen-stenciled to the halftone dot gradation pattern is indicated. To JP,6-94923,A, a foaming coating is printed as this optical diffusion layer, and the method of making detailed air bubbles form is indicated.
[0004] Most examination about the component part of other back light equipments is not made about the optical diffusion layer which prepared all of these improvement means in brightness in the light guide plate rear face by approaches, such as screen-stencil. Since it has the problem of the high frequency current leaking this type from a fluorescent lamp although the polyester film of silver vacuum evaporationo etc. may be used as a reflective sheet arranged so that a fluorescent lamp may be wrapped as what makes brightness high, and the consumed electric current increasing, at recent years, it is 75 micrometers in thickness. White polyester film etc. is used. Moreover, in the background of a light guide plate, it is 188 micrometers in thickness. White foaming polyester film is used. These white foaming polyester film is used for the above-mentioned patent official report also for invention of a publication. These white foaming polyester film had the low reflection factor compared with silver vacuum evaporationo polyester film, and the brightness when including in back light equipment was low about 10% or more.
[0005] For this reason, as an amelioration article which raised brightness more, as shown in drawing 2 , it is 75 micrometers in the above-mentioned thickness. White ink 6 is applied to the background of white foaming polyester film 5. Although the reflective sheet which has the reflecting layer 7 which consists of a barium sulfate and an acrylic binder was developed and used for the reflector side (Kimoto Make, RW75C), brightness was not that with which it improves only 3 to 5% compared with elegance conventionally, but satisfaction goes enough.

[0006] Moreover, thin shape-ization of a liquid crystal panel is desired and narrow diameter-ization of a fluorescent lamp is progressing as the result in recent years. 75 micrometers in thickness used so far In foaming polyester film, when including in back light equipment so that a fluorescent lamp may be wrapped in, there was a problem that the waist was too strong, workability was bad, and productivity did not go up. Moreover, light often caused from there the problem that leakage and brightness fell, by the box of a liquid crystal panel joining together, extruding a part, and producing a clearance. On the other hand, in order to weaken the waist, when thickness of white foaming polyester film was made thin, there was a problem that brightness fell, so that the film became thin.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] 75 micrometers in thickness which was used for wrapping the straight pipe-like fluorescent lamp of the thing of the inner edge method of the back light equipment of a liquid crystal display panel conventionally according to this invention Compared with white foaming polyester film, it is more thin and the reflective sheet which can realize the higher brightness of said back light equipment can be offered using a film with the weak waist.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] For this reason, in order to obtain the screen of high brightness, the reflection factor was more high and development of the weak reflective sheet of the waist was desired. The technical problem of this invention is offering such a reflective sheet.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] This invention is acrylic ester (meta) (the thing of acrylic ester or methacrylic ester is said.). It is below the same. It is the reflective sheet which comes to carry out the laminating of the reflective paint which comes to blend an empty capsid with the binder which consists of a copolymer to one side of film-like base materials, such as polyester.
[0009] the particle size of said empty capsid -- about 0.05-10 micrometers it is -- a thing is good. When smaller than about 0.05 micrometers, a particle small such is made from an emulsion polymerization, because it is difficult, and even if it can make, it is because it is low and light-scattering ability becomes [brightness] low. About 10 micrometers It is because the scattering power of light will fall and brightness will become low, if a case as many small holes are in a particle is removed (when it is not one spherical hole) if large. Moreover, as for the rate to the outer diameter of the bore of this empty capsid, 0.2-0.9 are desirable. This rate becomes [the rate of the hole of the interior at the time of forming a reflective-paint layer (it being called a "reflecting layer" below)] very small less than at 0.2, and brightness falls. Moreover, since it will become the form which could not maintain the shape of a ball and was crushed, or it will be divided and brightness will fall too when the reinforcement of an empty capsid fell and dries if 0.90 is exceeded, it is not desirable.
[0010] This empty capsid may be made of the organic material, and may be made of the inorganic material. It is more desirable to be made of the organic material, since the thing of the above-mentioned outer diameter is difficult to get, although the empty capsid of glass exists as an inorganic material. the diameter empty capsid of organic -- an acrylic monomer and a styrene system monomer -- an emulsion polymerization -- or a suspension polymerization is carried out and it is obtained. The detail of manufacture of this organic empty capsid is well-known, for example, is indicated by JP,62-127336,A, JP,3-9124,B, etc.
[0011] (Meta) The rate of a compounding ratio of a binder and an empty capsid which consists of an acrylic ester copolymer also affects brightness. the addition of an empty capsid -- the binder 100 weight section -- receiving -- desirable -- the 20 - 800 weight section -- it is the 100 - 300 weight section still more preferably. If there are few additions of an empty capsid than 20 weight sections, brightness will become small, and if [than the 800 weight sections] more, the film production nature of a reflective paint will worsen and will become the very weak film.
[0012] The binder used by this invention has high transparency, after use of long duration has that desirable in which the optical property does not deteriorate, and an acrylic ester (meta) copolymer is suitable for it. Specifically as this (meta) acrylic ester copolymer, an acrylic-acid (meta)-(meta) acrylic ester copolymer, an acrylic-acid (meta)-(meta) acrylic ester-styrene copolymer, a silicone graft (meta) acrylic ester copolymer, etc. are illustrated. Also in these resin, it is 50 micrometers in thickness. Although the film was produced on the film, that whose 23-degree C average transmission coefficient of the light of a 400-800nm wavelength field is 80% or more is desirable. Brightness becomes small and is not desirable when this permeability is less than 80%. Moreover, the glass transition temperature (Tg) of these resin has a desirable thing in the range of -75-30 degrees C. With the acrylic ester (meta) copolymer below -75 degree C, cohesive force runs short of Tg, and a tuck comes out to a reflecting layer front face, and it dirt-comes to be easy. When Tg exceeded 30 degrees C, the flattery nature of a reflecting layer

is lost and a reflective sheet is incurvated, a reflecting layer crocodiles and peeling-omission-comes to be easy.

[0013] The effect of as opposed to brightness in the direction of permeability of a binder is larger than a refractive index, and especially the permeability after aging is important for it. Even if high brightness is shown in early stages, in that to which the permeability after heat aging falls, the brightness after long duration use falls and it is not desirable. Moreover, as properties other than brightness, film production nature and adhesion with a base material are also important, and what has these not enough has risk of causing the serious defect in which it separates and falls from a base material after long duration use. The result evaluated about the binder is shown in Table 1. Data given in Table 1 are data of 1-time observation.

[0014]

[Table 1]

A binder Permeability (%) Permeability (%) Name of article A manufacturer Class Refractive index First stage After heat aging E-1054K Soken Chemical & Engineering, Inc. Acrylic 1.470 94.6 91.5 AN-49B Soken Chemical & Engineering, Inc. Acrylic 1.468 95.6 93.4 E-2150 Soken Chemical & Engineering, Inc. Acrylic 1.472 93.6 89.0 SX-8307A04 Japan Synthetic Rubber Co., Ltd. Acrylic - 1.476 100.0 96.2 Silicone S-6211 Toho Chemical Industry Co., Ltd. Polyethylene 1.503 97.550.0 RW75C Kimoto [Table 1] (continuation)

Binder Brightness (%) Brightness (%) A name of article First stage After heat aging Adhesion of a reflecting layer E-1054K 106.7 98.0 Fitness AN-49B 106.8 102.0 Fitness E-2150 104.3 98.8 Fitness SX-8307A04 102.0 100.0 It separated after aging and fell. S-6211 103.5 79.2 RW75C * which separated after aging and fell 100.0 - Good Notes

Refractive index: It measured with the Abbe refractometer.

Permeability: The U-4000 mold recording spectrophotometer (Hitachi Make) was used.

50 micrometers in thickness The film was made and it measured on the wavelength of 400nm. Each above-mentioned film has the smallest permeability of 400nm in 400-800nm of wavelength fields.

Heat-aging conditions: 100 degrees C, 180 hours.

Brightness: The reflective sheet which the empty capsid (the Nippon Zeon Co., Ltd. make and MH5055 are used) was mixed with these binders at a rate of 100:200 (weight ratio), and also consists of a reflecting layer, a base material, and a white ink layer like the after-mentioned example 14 was made, and brightness was measured. The numeric value of brightness was expressed as the rate (%) to the brightness of Kimoto RW75C (first stage). The brightness of the heat aging sample of RW75C has not been measured.

Adhesion of a reflecting layer: Adhesion was observed with the naked eye about the reflective sheet made like the time of measuring the above-mentioned brightness.

* : it is not a binder but a reflective sheet.

[0015] Although the reflective sheet made using the above-mentioned SX-8307A04 separated after heat aging and fell in the above-mentioned trial, this point can improve by priming etc.

[0016] Said reflective sheet applies the fluid reflective paint which comes to mix a drainage system acrylic binder to the water dispersing element of an empty capsid to a base material, and can manufacture it by drying. It includes that that it describes above " applies" applies and carrying out a spray. The temperature at the time of said desiccation is 90 degrees C or more, and is desirable. [of the melting point of said base material or below softening temperature] Said reflective paint makes a solvent distribute the empty capsid marketed by fine particles, and although obtained also by combining a binder, it can manufacture that it is easier from a viewpoint of productivity to mix a drainage system acrylic binder to a water dispersing element, and cheaply. the thickness of the reflective paint after desiccation — 10-100 micrometers it is - - things are desirable. 10 micrometers In the following, brightness is low and it is 100 micrometers. It is for a problem to crop up at spreading processes — if it exceeds, a front face will crocodile, or a spreading rate falls. the case where the reflective paint of a drainage system is used — drying temperature — 100 degrees C or more — required — in addition — and dimensional stability is required on the occasion of use. For this reason, as a base material, polyester film or foaming white polyester film is desirable.

[0017] As an example of a film usable as a base material, films, such as extension polypropylene, polyester, nylon, a polycarbonate, polysulfone, polyether sulphone, a polyether ether ketone, polyphenyl sulfide, polyarylate, polyethylenenaphthalate, the polyester ether, and a polyvinyl chloride, an acrylic film, the poly methyl terpene resin film, etc. are mentioned. The thickness of these films is 75 micrometers as stated also in advance. The thinner one is desirable. The thickness of this film is 75 micrometers. When the package of a reflective sheet which wraps in the fluorescent lamp in a back light sheet became imperfect besides the problem that the workability at the time of including in back light equipment is bad so that a fluorescent lamp may be wrapped in as it is above, and productivity does not go up, light often caused from there the problem that leakage and brightness fell. Moreover, when too thin, it is not desirable in order for it to become impossible to arrange so that a beautiful arc may be drawn and to reduce brightness, when a wrinkling comes together and a reflective sheet is wound around fluorescence tubing, in case there is too little repulsion and it incorporates. For this reason, the thickness of polyester film is 25-50 micrometers. It is desirable. The workability when changing the thickness of polyester film is shown in Table 2.

[0018]

[Table 2]

A film Thickness (micrometer) Inclusion workability Condition after inclusion Optical leakage 12 Fitness A wrinkling enters. Have no leakage. 25 Fitness Have no wrinkling. Have no leakage. 38 Fitness with no wrinkling-less leakage 50 repulsion -- strong -- activity difficulty With no wrinkling With no leakage 75 repulsion -- strong -- elapsing -- activity difficulty Curvature size of an arc [0019] which leaks from a clearance somewhat The reflecting layer of a reflective sheet is possible also for forming the high white coating of the concealment nature containing titanium oxide between the opposite side or a base material, and a reflecting layer. By preparing the concealment layer of such white, transparency of light can be prevented and brightness can be raised. The sectional view of an example of this invention is shown in drawing 1 . As for a base material layer and 2, in this drawing, 1 is [a reflective-paint layer and 3] white ink layers.

[0020] Brightness can be improved also by blending inorganic white pigments or a hollow glass bead with a comparatively large particle size (it being technically difficult to make a hollow glass bead with a diameter smaller than 10 micrometers now) with a reflective paint as the 3rd component. As inorganic white pigments, titanium oxide, zinc sulfide, a hollow glass bead, a barium sulfate, an aluminum silicate, a titanium oxide content acrylic bead, etc. are illustrated. Also in these, when titanium oxide, zinc sulfide, etc. are mixed to a reflective paint, even if there is no above-mentioned concealment layer, high brightness is obtained.

[0021] It is also possible to apply to an acrylic ester copolymer further (meta) the reflective paint which comes to blend inorganic white pigments on the reflecting layer of a reflective sheet. In such a case, it is 1-10 micrometers on a reflecting layer about what blended inorganic white pigments with the acrylic resin 100 weight section with high permeability with sufficient film production nature before and after the 100 weight sections. Surface reinforcement can be raised by what (it is called topcoat) is applied by thickness, without reducing brightness.

[0022] Since a reflective sheet is arranged so that it may be twisted around a fluorescent lamp and a reflective sheet deteriorates under the effect of ultraviolet rays and the heat which are emitted from a fluorescent lamp, the optical property, especially brightness may fall depending on an operating condition. in order to prevent these problems -- a reflective paint -- an antioxidant, an ultraviolet ray absorbent, or UV stabilizer -- 0.01 - 5wt% -- adding is desirable. As an anti-oxidant, 2, 4-screw [(octylthio) methyl]-o-cresol, iso octyl-3-(3, 5-G t-butyl-4-hydroxyphenyl) propionate, etc. are mentioned. As an ultraviolet ray absorbent, a methyl-3-[3-t-butyl-5-(2H-benzotriazol-2-IRU)-4-hydroxyphenyl] propionate-polyethylene glycol, a hydroxyphenyl benzotriazol derivative, etc. are mentioned. As UV stabilizer, screw (2, 2, 6, and 6-tetramethyl-4-PIPEJIRIJIRU-4-piperidyl) sebacate etc. is mentioned. These are good to use independently and mixing and using is also possible. Moreover, effectiveness is for adding the inorganic filler which has said ultraviolet ray absorbent or an ultraviolet-rays shielding effect in said topcoat to also raise weatherability. Since it is the minute empty capsid which mainly contains the styrene in a reflective paint, that it is the cause of degradation by ultraviolet rays has effectiveness also in

permuting a part of empty capsid by the inorganic filler with more sufficient weatherability improving weatherability.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example] According to the report of each manufacturer, in the following examples and examples of a comparison, the contents of the empty capsid used for the reflective paint are as follows.
[Table 3]
A lot number A manufacturer An ingredient Outer diameter (micrometer) A bore / outer-diameter OP-62 Loam & Haas . Japan, Inc. Styrene acrylic 0.45 0.69 OP-84J Loam & Haas . Japan, Inc. Styrene acrylic 0.55 0.64 HP-91 Loam & Haas . Japan, Inc. Styrene acrylic 1.00 0.80 AE-863A Japan Synthetic Rubber Co., Ltd. Styrene acrylic 0.35 0.80 MH5055 Nippon Zeon Co., Ltd. Styrene acrylic 0.50 0.82 [0024] Moreover, the binders used for this reflective paint were the Soken Chemical & Engineering make and SK dyne (trade name) AN-49B, the ingredient was an acrylic ester copolymer, that Tg was -48 degree C, and the average transmission coefficient of the light in the wavelength field which is 400-800nm was 97%.
[0025] Moreover, the contents of the filler used for such reflective paints or topcoats were as follows.
[Table 4]
A manufacturer A trademark thru/or a lot number An ingredient cable address Dainichiseika Colour & Chemicals Mfg. Co., Ltd. in Table 5 EP -- 677 White TiO2 677 White SACHTLEBEN CHEMIE SAKUTORISU (trademark) ZnS HD-S GMBH HD-S Toshiba Ballotini Toshiba hollow glass A hollow glass bead HSC110 Co., Ltd. -- Bead HSC110 Degussa Japan Aluminum Silicate Aluminum silicate P-820 Co.Ltd. P-820 Merck Japan IRIO DIN Pearl pigment 103W2 Co., Ltd. -- (trademark) 103W2 [0026] (Examples 1-7) white foaming polyester film (the product made from ICI --) with a thickness of 36 micrometers the easily-adhesive processing side of MELINEX (trademark)337 (examples 1-2, 4-7) or non-foamed transparence polyester film (example 3) with a thickness of 36 micrometers -- white ink (the Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make --) RAMIKKU (trademark) F-220HC -- white -- what blended titanium oxide into the acrylic urethane binder -- it is -- titanium oxide 50wt% -- the thickness after drying what is contained -- 20 micrometers Spreading desiccation was carried out so that it might become, and the white sheet was obtained. About the reflective paint mixed by combination given in Table 3 on the white ink layer of this white sheet, the thickness after desiccation is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. The slit of the obtained reflective sheet is carried out to the shape of a strip of paper with a width of face [of 20mm], and a die length of 219mm. A double faced adhesive tape (NITTO DENKO CORP. make #531) with a width of face of 2mm is used. It fixed to said light guide plate, it included in back light equipment, and brightness was measured so that fluorescence tubing with a diameter of 2.6mm arranged at the end of a light guide plate (thickness of 3.2mm of width of face of 164mm, die-length 219 mm, and a fluorescence tubeside, thickness of 1.2mm of the opposite side) might be wrapped in. Luminance-meter LS-110 by Minolta Co., Ltd. were used for measurement of brightness. Brightness is similarly measured about Kimoto RW75C (example 1 of a comparison), and the value (%) of the relative brightness to this is shown in Table 5.
[0027] (Examples 8-19) For a white ink layer, to the same transparence sheet (example 9) as having used in the same white sheet (examples 8, 10-19) or same example 3 as having used in

the example 1, the thickness after drying a reflective paint given in Table 5 to the field of the opposite side is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. About this reflective sheet, brightness was measured like the example 1. The value of this relative brightness is shown in Table 5.

[0028] (Examples 20-22) The reflective paint containing the filler indicated in Table 5 on the reflective paint of the reflective sheet obtained in the example 8 (the used binder) The product made from Japanese Composition, a silicone graft type acrylic ester copolymer (trade name: silicone acrylic emulsion SX-8307(A)04), The average transmission coefficient of the light in a wavelength field (Tg=5 degree C and 400-800nm) carries out spreading desiccation of the 100% so that the thickness after desiccation may be set to 5 micrometers (the layer obtained by doing in this way is called topcoat.). The reflective sheet was obtained. About this reflective sheet, brightness was measured like the example 1. The value of this relative brightness is shown in Table 5.

[0029] (Example 1 of a comparison) Brightness was measured like the example 1 using Kimoto reflective sheet RW75C. The result is shown in Table 5. In addition, this reflective sheet is 75 micrometers in thickness. In the background of white polyester film, it is TiO2 to an urethane binder. It is 30 micrometers in thickness about the white ink which it comes to mix. 5 micrometers in thickness which applies and is from a barium sulfate and an acrylic binder on a reflector side It is the sheet which has a reflecting layer.

[0030] (Example 2 of a comparison) 36 micrometers in thickness The thickness after drying white ink (the Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make, RAMIKKU (trademark) F-220HC white) (titanium oxide) to the easily-adhesive processing side of the polyester film (the product made from ICI, MELINEX 337) of a white sheet is 20 micrometers. Spreading desiccation was carried out so that it might become, and the white sheet was obtained. About the case where the white ink side of this white sheet is turned to fluorescence tubing, brightness was measured like the example 1. The result is shown in Table 5.

[0031] (Examples 3 and 4 of a comparison) For the white ink layer of the example 2 of a comparison, the thickness after drying a reflective paint given in Table 5 to an opposite side is 50 micrometers. Spreading desiccation was carried out and the reflective sheet was obtained so that it might become. Brightness was measured like the example 1 about this reflective sheet. The result is shown in Table 5.

[0032]

[Table 5]

Example Reflective sheet Reflecting layer combination (or configuration) Compounding ratio (weight ratio) Example of a brightness comparison Configuration empty capsid Binder Filler hollow: — binder: — filler (%) Example 1 RWB OP-62 AN-49B - 200:100 113 Example 2 RWB OP-62 AN-49B - 400:100 121 Example 3 RWB OP-62 AN-49B - 200:100 115 Example 4 RWB OP-62 AN-49B 677White 150:100:50 115 Example 5 RWB OP-62AN-49B HD-S 160:100:40 117 Example 6 RWB OP-62 AN-49B HSC110 160:100:40116 Example 7 RWB OP-62 AN-49B P-820 160:100:40 115 Example 8RBW OP-62 AN-49B - 200:100 121 Example 9 RBW OP-62 AN-49B - 200:100 118 Example 10 RB OP-62 AN-49B -200:100 117 Example 11 RBW OP-84J AN-49B - 200:100 117 Example 12 RBW HP-91AN-49B - 200:100 120 Example 13 RBW AE-863A AN-49B - 200:100 117 Example 14 RBW MH5055 AN-49B - 200:100 117 Example 15 RBW OP-62 AN-49B 677White 150:100:50 118 Example 16 RBOP-62 AN-49B 677White 150:100:50 115 Example 17 RBW OP-62 AN-49B HD-S 160:100:40 121 Example 18 RBW OP-62 AN-49B HSC110 160:100:40 120 Example 19 RBW OP-62 AN-49B P-820 160:100:40 117 Example 20 TRBW1 OP-62 AN-49B - 200:100 117 Example 21 TRBW2 OP-62 AN-49B - 200:100 117 Example 22 TRBW3 OP-62 AN-49B - 200:100 115 Example 1 of a comparison RBW Kimoto Make, RW75C - 100 Example 2 of a comparison WB MELINEX 337 36micrometer WhitePET - 107 Example of comparison 3RBW - AN-49B 103W2 0:100:200 90 Example 4 of a comparison RBW - AN-49B HSC110 0:100:200 103 Notes

R: Reflecting layer W: White ink layer B: Base material layer T: Topcoat layer TRBW1: It is BaSO4 as a filler of topcoat. Use.

TRBW2: Use the Toshiba Ballotini Co., Ltd. make and Toshiba hollow glass bead HSC-110 (trade

name) as a filler of topcoat.
TRBW3: It is Degussa as a filler of topcoat. Japan Co
The product made from Ltd., Aluminum Silicate P-820 is used.
[0033] (Example 23) To the reflective paint, everything but having carried out 2.0 weight sections addition of Ciba-Geigy Japan TINUVIN (trademark)765 by solid content conversion obtained the reflective sheet by the same approach as an example 8 as UV stabilizer. When this reflective sheet was built into the back light unit and measured, brightness high 15% was shown compared with Kimoto RW75C. Moreover, the reflective sheet and Kimoto RW75C which were obtained as mentioned above were respectively included in the back light unit, and after leaving it in 80-degree C oven for 230 hours, energizing to a fluorescent lamp, only the reflective sheet was taken out and it included in a new back light unit. When each brightness was measured, the reflective sheet obtained as mentioned above showed the value high 12% to Kimoto RW75C, although brightness was falling 3% to initial value.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

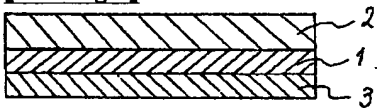
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of an example of this invention reflective sheet.
[Drawing 2] The sectional view of an example of the conventional reflective sheet.
[Description of Notations]
1 -- Base material layer
2 -- Reflective-paint layer
3 -- White ink layer
5 -- White foaming polyester film
6 -- White ink layer
7 -- Reflecting layer

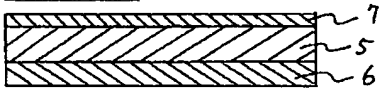
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]